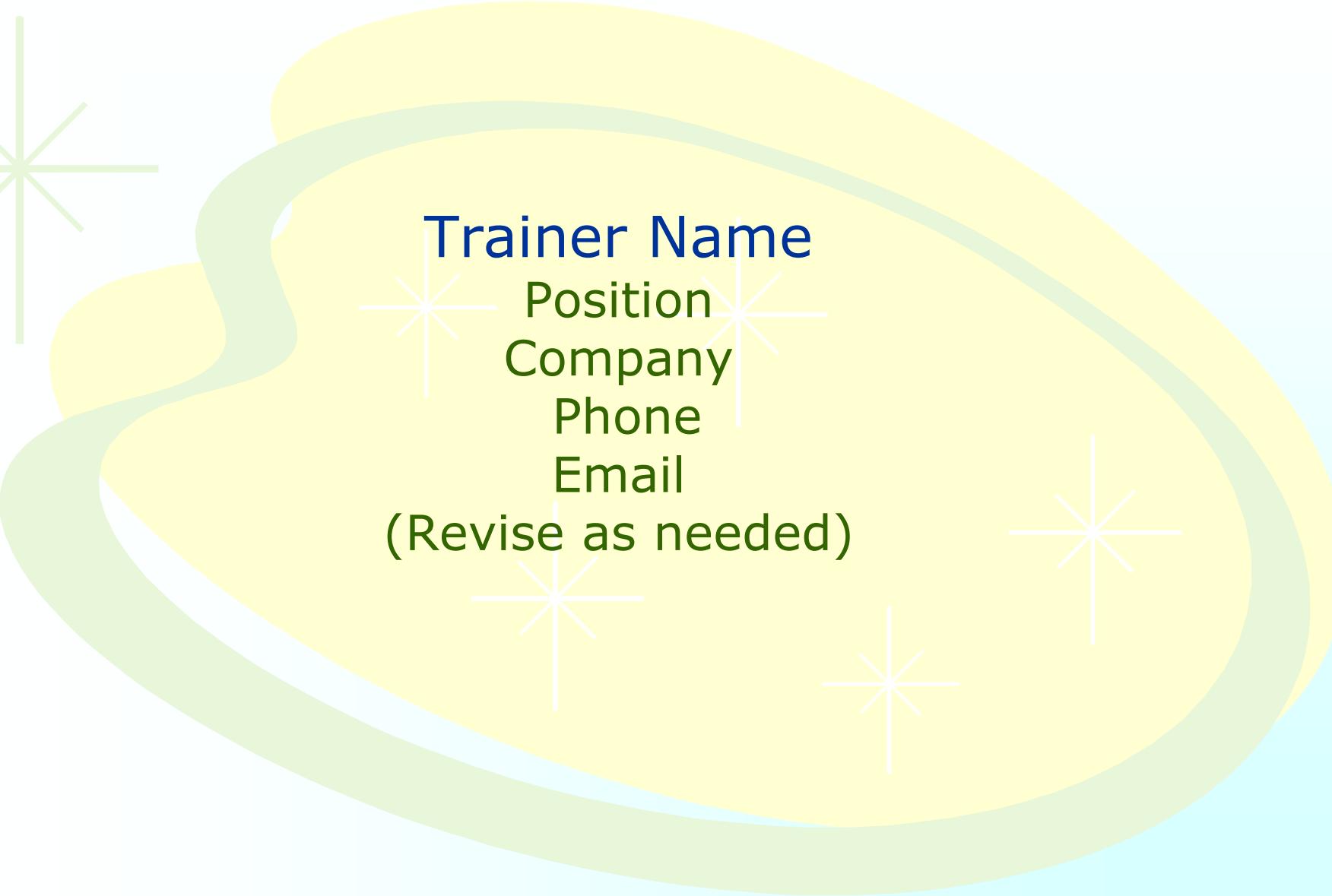


Introduction to Confined Space Safety



OR-OSHA 215
0501



Trainer Name

Position

Company

Phone

Email

(Revise as needed)



Objectives

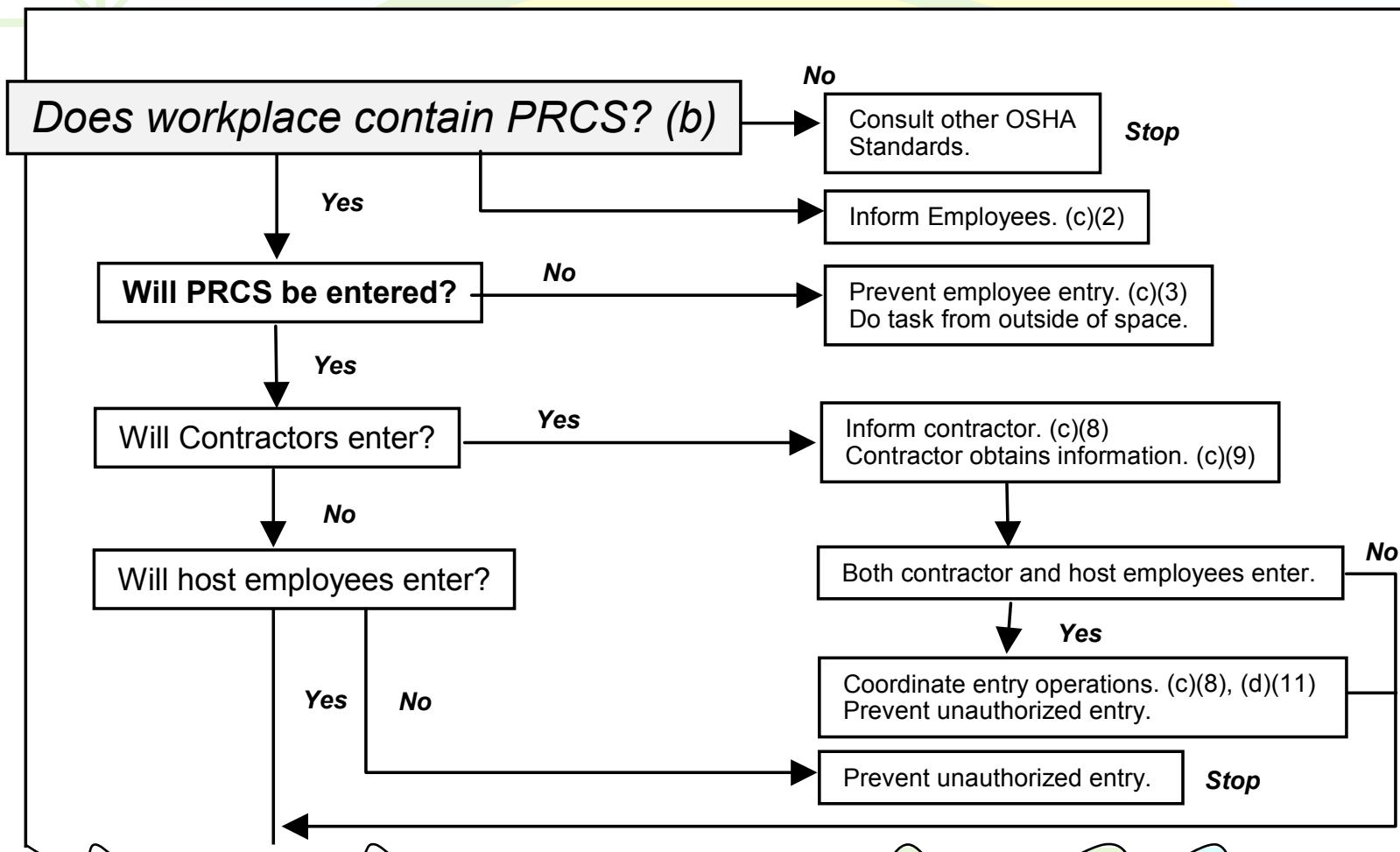
This class provides the following information:

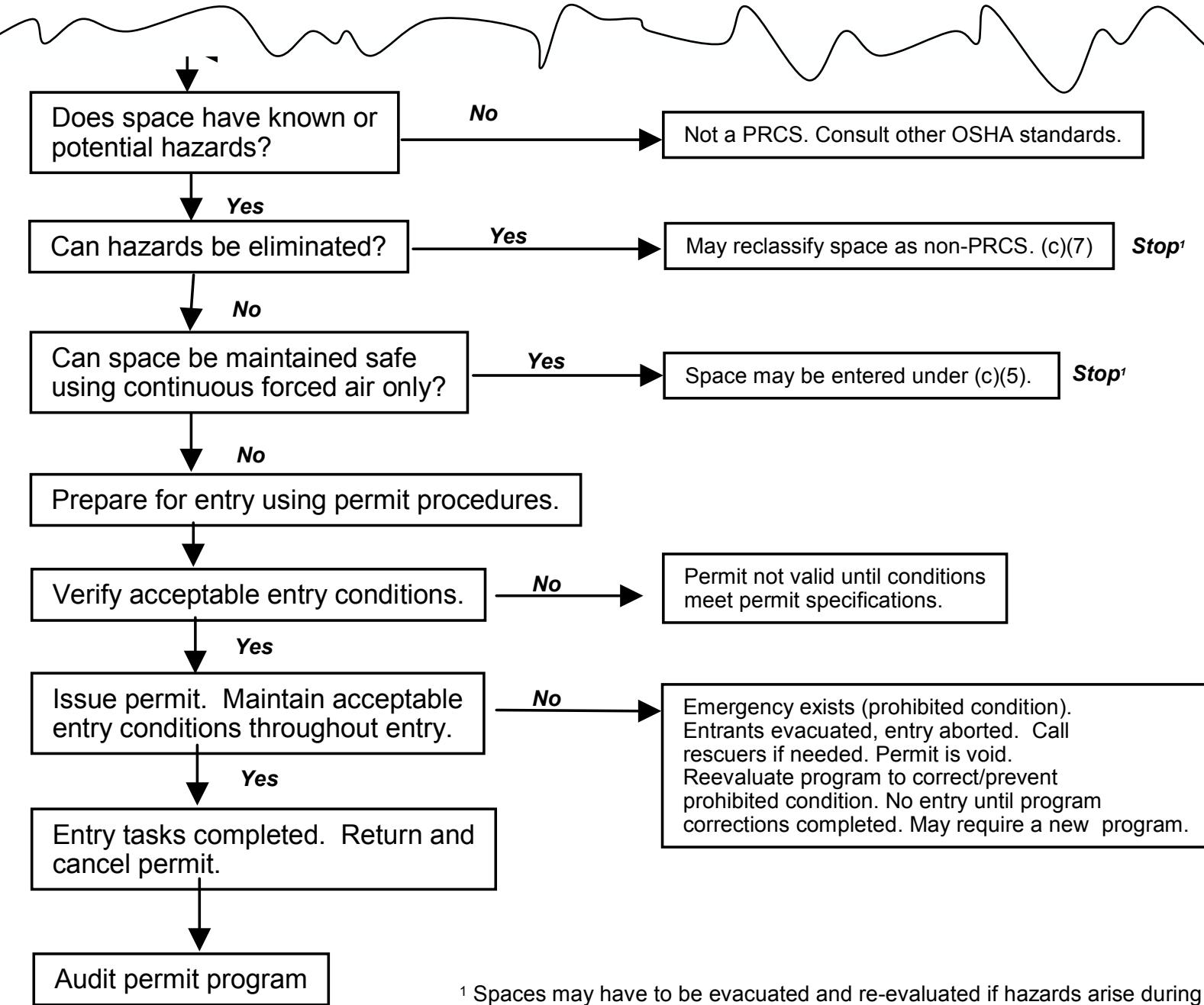
- 1. Criteria for confined spaces and permit-required confined spaces.**
- 2. Hazards which may exist in permit-required confined spaces.**
- 3. Steps in developing a permit-required confined space program.**
- 4. Training requirements.**

Why a Permit-Required Confined Space Program?



A quick reference to the Permit-Required Confined Space Standard





¹ Spaces may have to be evacuated and re-evaluated if hazards arise during entry.

Evaluate Your Workplace

1. Does the workplace contain a confined space?

Yes! if the space is...

- 1. Large enough for whole body to enter and work, and**
- 2. Limited access or egress, and**
- 3. Not designed for continuous occupancy**

What is meant by *limited or restricted entry and exit*?

What is meant by *not designed for continuous occupancy*?



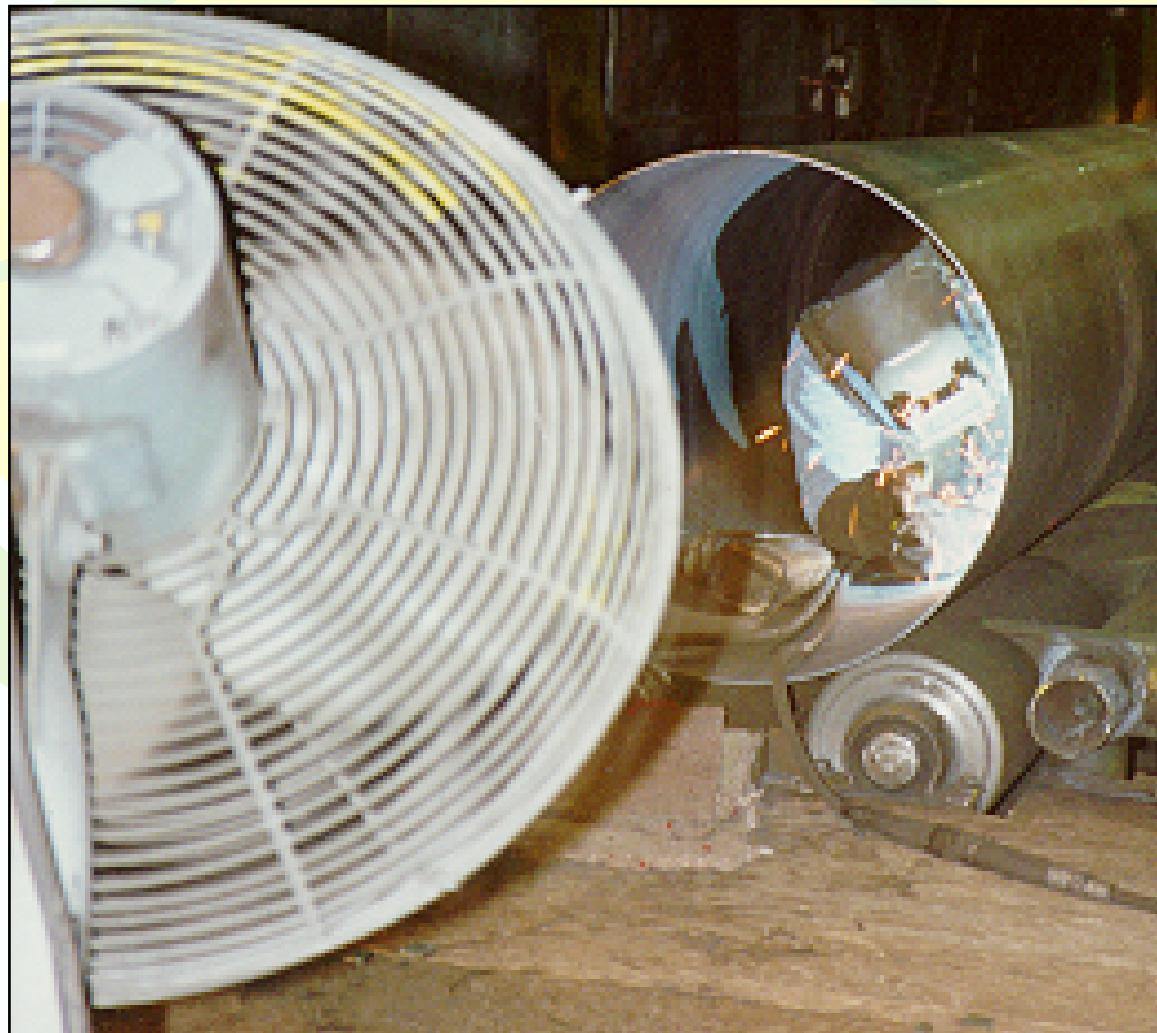
2. Does the workplace contain permit-required confined spaces (PRCS)?

Yes, if it's a *confined space* and it...

- 1. Contains hazardous atmosphere, or**
- 2. Has potential for engulfment, or**
- 3. Has dangerous configuration, or**
- 4. Contains other serious safety or health hazards.**

Evaluating Confined Spaces for Hazards

Hazardous Atmospheres



1. Oxygen Level {too high or too low?}

23.5% and above

= High

20.8 - 21%

= Normal

19.5% and below

= Deficient

Atmospheric conditions in a confined space can change greatly within a few minutes.

Why would too much oxygen be hazardous?

How could you have too much oxygen?

What are some causes or indications of possibly having a deficient oxygen atmosphere inside a space?

Suspect O₂ Deficient When:

- Space has been closed up, sealed or ventilated before entry.
- Has contained inerted atmosphere or has been purged.
- Contains any amount of water or organic material.
- Metal Oxidation - rusting.
- Combustion processes.
- Displacement by other gases.
- Coatings, sludges, materials with cure and/or absorb oxygen - activated charcoal.



Dangers of Low Oxygen Levels

16 - 12% O₂ in Air

Deep breathing, fast heartbeat, poor attention, poor thinking, poor coordination

14 - 10% O₂ in Air

Faulty judgment, intermittent breathing, rapid fatigue (possibly causing heart damage), very poor coordination, lips turning blue

10% or less O₂ in Air

Nausea (vomiting), loss of movement, loss of consciousness followed by death

Less than 6% O₂ in Air

Spasmodic breathing, convulsive movement, death in approx. eight minutes

4% - 6% O₂ in Air

Coma in 40 seconds

29 CFR 1926 Subpart P

Air quality tests taken before entry.

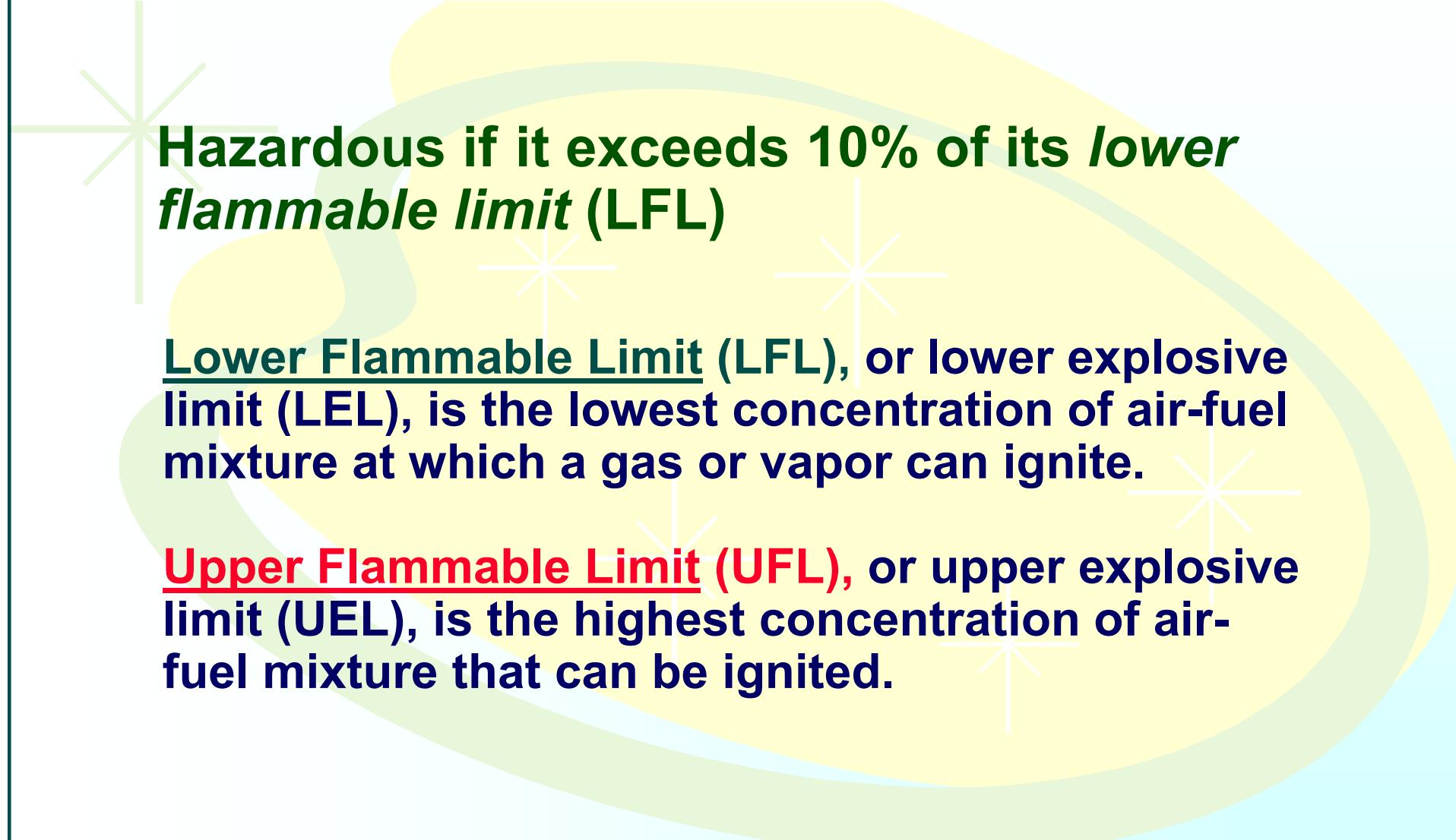
Excavations more than 4 ft. deep when hazardous atmosphere exists or could exist.

Tests conducted as necessary, including checks for flammable gases and oxygen deficiency.

Where hazardous atmospheres exist or could be expected to exist, emergency rescue equipment must be on worksite and readily accessible.



2. Flammable/Explosive Gas, Vapor, Mist

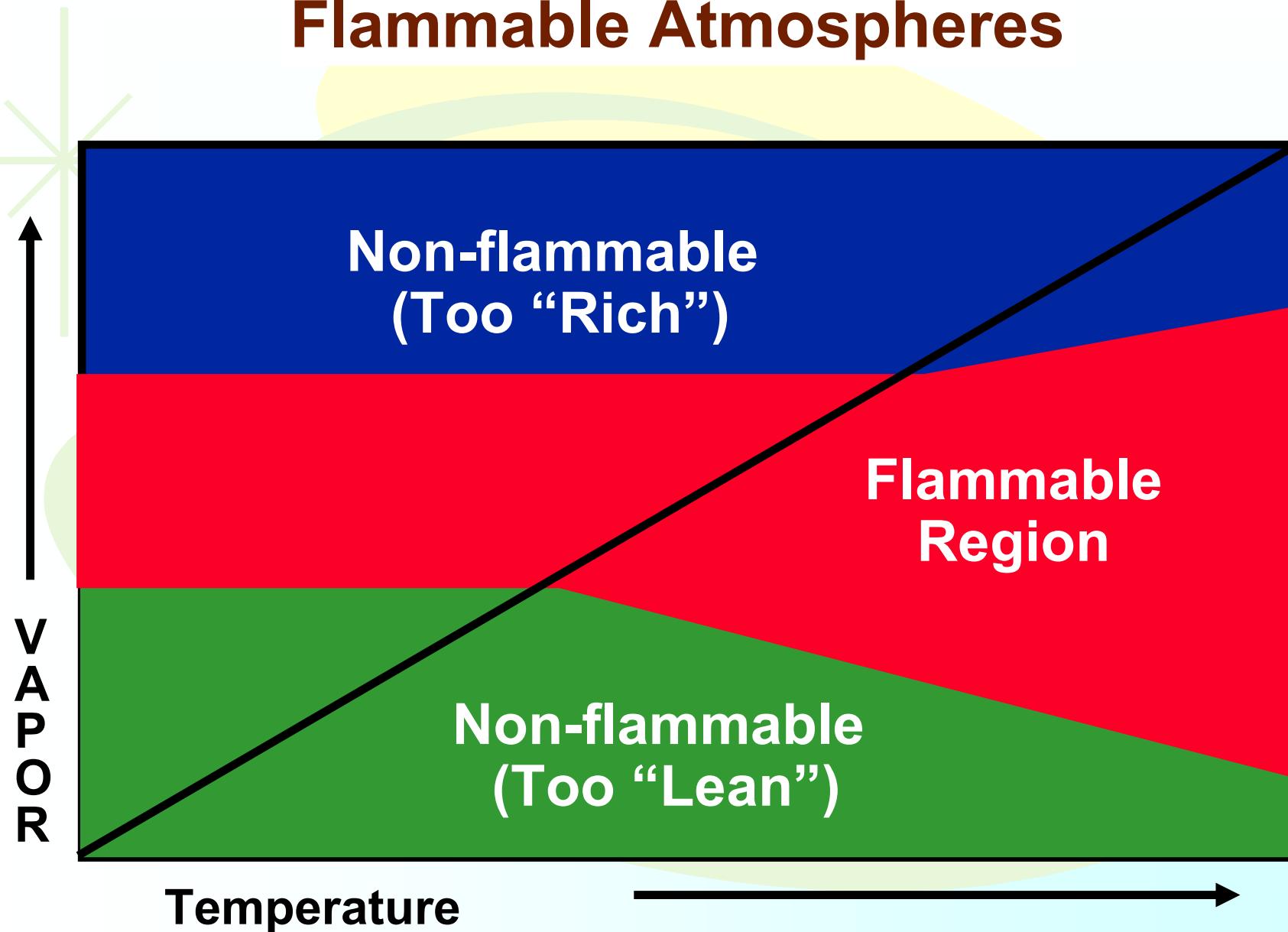


Hazardous if it exceeds 10% of its *lower flammable limit (LFL)*

Lower Flammable Limit (LFL), or lower explosive limit (LEL), is the lowest concentration of air-fuel mixture at which a gas or vapor can ignite.

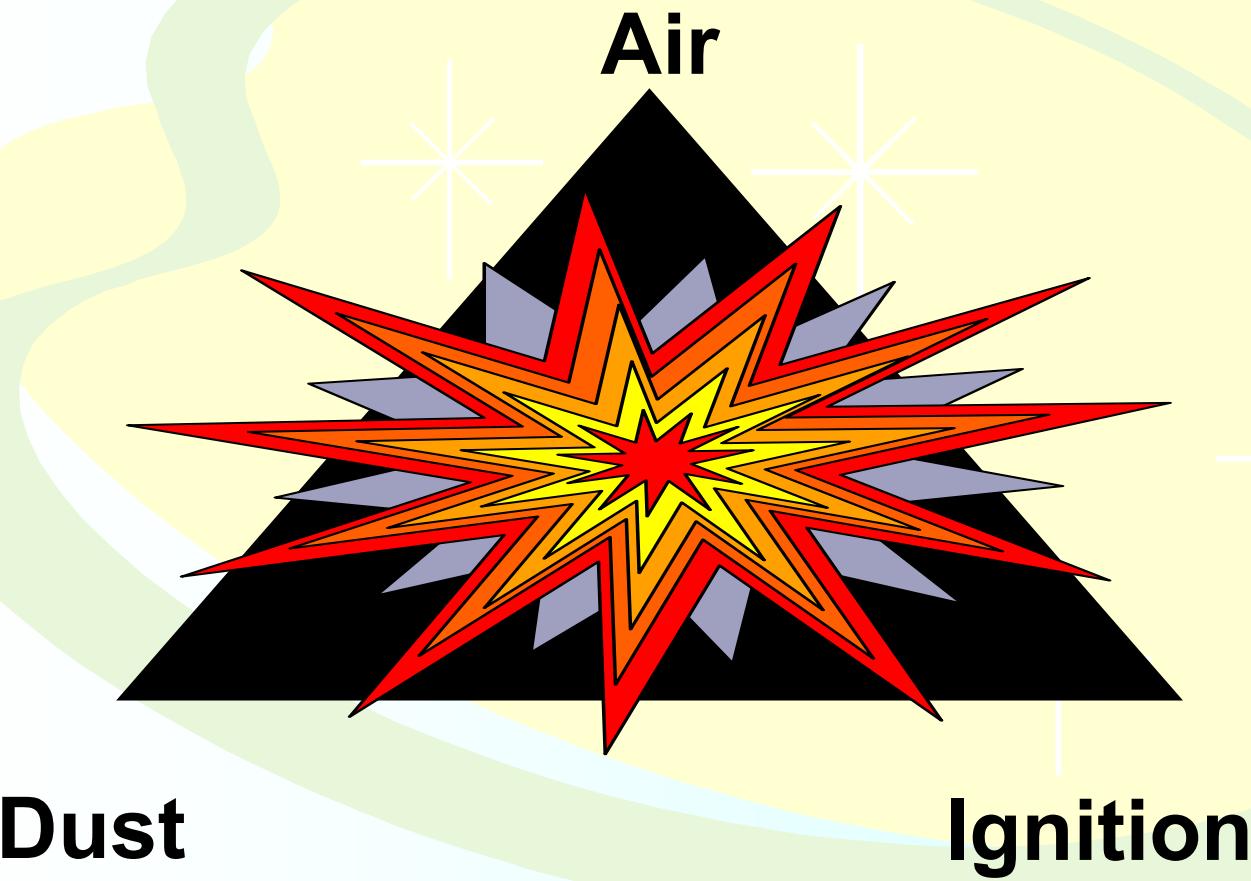
Upper Flammable Limit (UFL), or upper explosive limit (UEL), is the highest concentration of air-fuel mixture that can be ignited.

Flammable Atmospheres



Airborne Combustible Dust

Explosive when concentration is between the LEL & UEL!



3. Toxic Substances

Hazardous if they exceed doses or *permissible exposure limits (PEL)* published in:

OR-OSHA Division 2 Subdivisions G & Z

Refer to your material safety data sheets for chemical-specific toxicity characteristics, health hazards, reactivity hazards, etc.

Substance

Permissible Exposure Limit (PPM)

Carbon Dioxide

5,000

Carbon Monoxide

50

Hydrogen Sulfide

20

Methane

1,000

Nitric Oxide

25

Oxygen diflouride

0.05

Phosgene (carbonyl chloride)

0.1

Sulfur Dioxide

5

Stoddard Solvent

500

Engulfment

- Liquid or flowable solids
- Can be aspirated
- Can cause death by:

**Plugging respiratory system,
Strangulation,
Constriction, or
Crushing**

Hazardous Configuration

Can trap or asphyxiate

Inwardly converging walls, or

Floor slopes downward, or

Floor tapers to smaller cross-section

Any Other Recognized Serious Safety or Health Hazard



- Electrical equipment**
- Mechanical equipment**
- Visibility - lighting**
- Biohazards**
- Claustrophobia**
- Noise**
- Radiation**
- Temperature**

Once you have evaluated and identified the permit-required confined spaces at your workplace, inform employees through signs and/or other equally effective means.



Permit-Required Confined Space Entry





How is PRCS “entry” defined?

When any part of the body breaks the plane of the opening in a permit required confined space.

If permit-required confined spaces will not be entered, you must still take all measures to prevent entry!

How?

When contractors enter your permit spaces:

Employer

- ↳ Ensure compliance with permit space program
- ↳ Hazards of the permit space
- ↳ Precautions and procedures
- ↳ Coordinate entry operations (if conducted)
- ↳ Debrief when completed (hazards found or created)

When contractors enter your permit spaces:

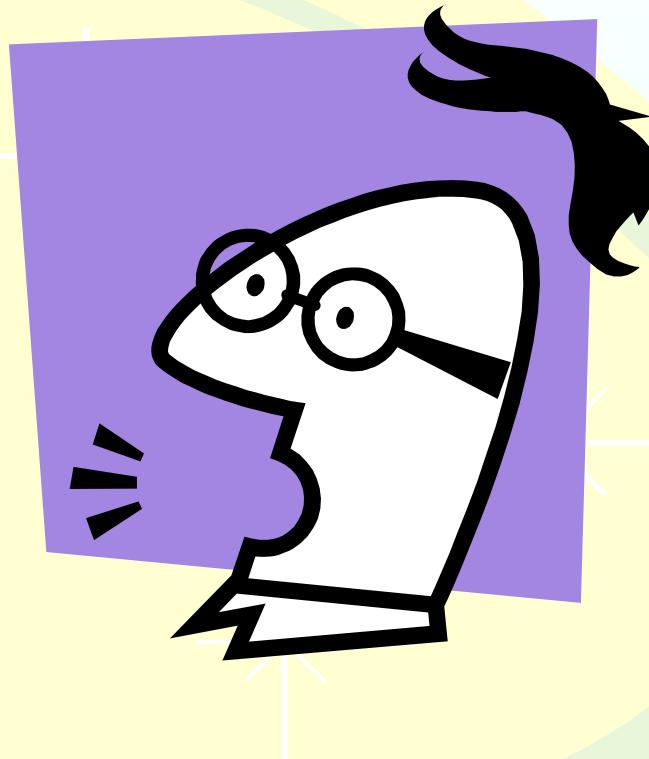
Contractor

- ↳ Obtain information about permit space hazards & entry operations
- ↳ Coordinate entry operations (if conducted)
- ↳ Brief employer on permit space program being used
- ↳ Debrief employer on hazards confronted or created

What does this basically involve?

Quick Quiz

(actually a recap)!



When your Employees enter Permit-Required Confined Spaces

1. *Can the hazard(s) which made the space a permit space be eliminated?*

If YES The space can be reclassified as a nonpermit-required space.

If NO Prepare for permit entry or consider another question.....

2. Is the only hazard of the permit space an actual or potential atmospheric hazard?

If NO Entry made under the permit system only.

If YES You can follow the alternative (c)(5) procedures!

Before we discuss (c)(5) procedures:

 **Control of the atmospheric hazard through forced air ventilation does not constitute *elimination* of the hazard.**

 **When following these (c)(5) procedures exclusively, the employer is not required to develop a permit entry system, establish an entry team, or provide a rescue system.**

Of course, these elements are required when entering permit spaces through the permit system.



The alternative (c)(5) procedures are allowed when...

- ↖ Verification is made that using continuous forced air ventilation is safe;
- ↖ Monitoring and inspection data supports the atmospheric hazard is the only hazard and the forced air ventilation is effective;
- ↖ Data is documented and made available to entrants.

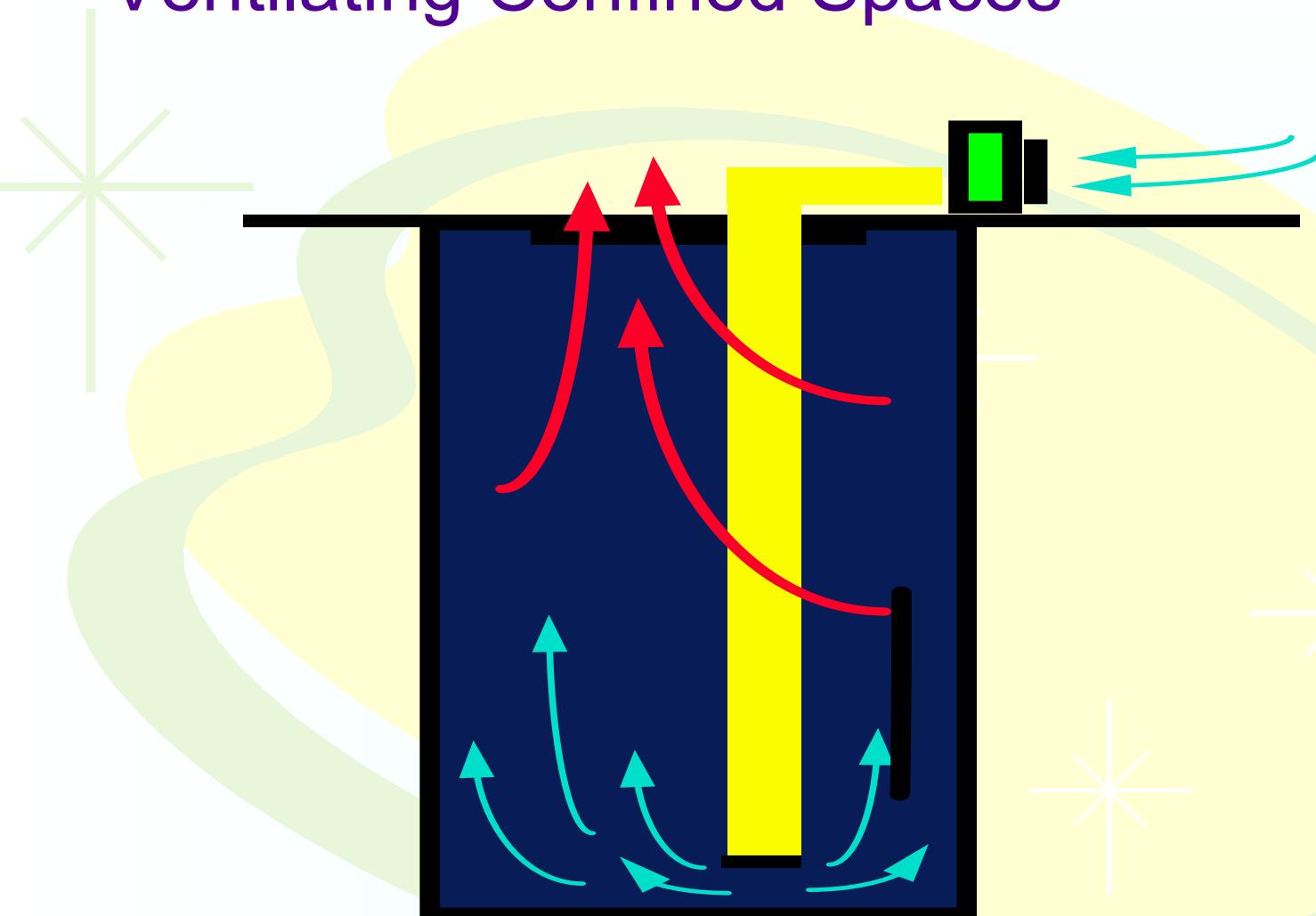
And once the above are met.....

- ↖ **Ensure safety before removing a cover and guard opening immediately;**
- ↖ **Test internal atmosphere (O,F,T) - observation available to entrant;**
- ↖ **Continuous forced air ventilation;**
- ↖ **Atmosphere periodically tested - observation available to entrant;**
- ↖ **Evacuate immediately if necessary and evaluate what went wrong;**
- ↖ **Verify these procedures were conducted through a written certification.**

More on the Alternative (c)(5) Procedures!

- ↳ No entry until FAV has eliminated any hazardous atmosphere;
- ↳ Direct FAV to ventilate immediate work area and areas where the entrant will likely be (be aware of pockets within the space);
- ↳ FAV must continue until all workers have left the space;
- ↳ FAV must have clean source;
- ↳ FAV must not increase the hazards in the space.

Ventilating Confined Spaces



Ventilation Equipment

- Natural - rarely dependable
- Mechanical -
 - preferred, positive hazard reduction
 - depends on configuration
 - consider nature of atmospheric hazard



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**Remember, ventilation must
be continuous during entry!**

Air Monitoring Equipment

Used during initial investigation prior to, and during confined space entry.

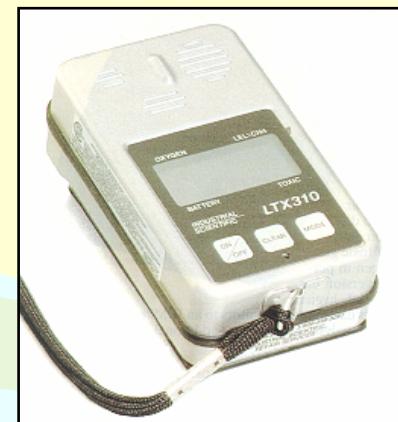
Tests for:

1. Oxygen content
2. Flammable gases and vapors
3. Toxic gases and vapors

(Note: You must test in this order)



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Detector Tubes

Sealed glass tubes

Crystals react with airborne chemicals

Reaction results in color change

Specific for the substance of concern

Can be inaccurate +/- 25%

False readings from other chemicals

Gas Detection Instruments

Sensors measure concentrations

Results in a meter or digital reading; alarms

Portable multi-gas instruments

Accurate

May react to interfering chemicals

Sampling

Methane
(lighter than air)

Carbon Monoxide
(same as air)

Hydrogen Sulfide
(heavier than air)

The Entry Permit System



What is the written plan?

- ↗ The measures implement to prevent unauthorized entry
- ↗ The identification & evaluation of all permit space hazards prior to entry
- ↗ The development & implementation of safe entry operations
- ↗ Providing and maintaining all necessary equipment (PPE, monitors, etc.)
- ↗ Evaluating permit space conditions before & during entry operations
- ↗ Providing at least one attendant & developing procedures for multiple spaces
- ↗ Designating and training all persons who have active roles

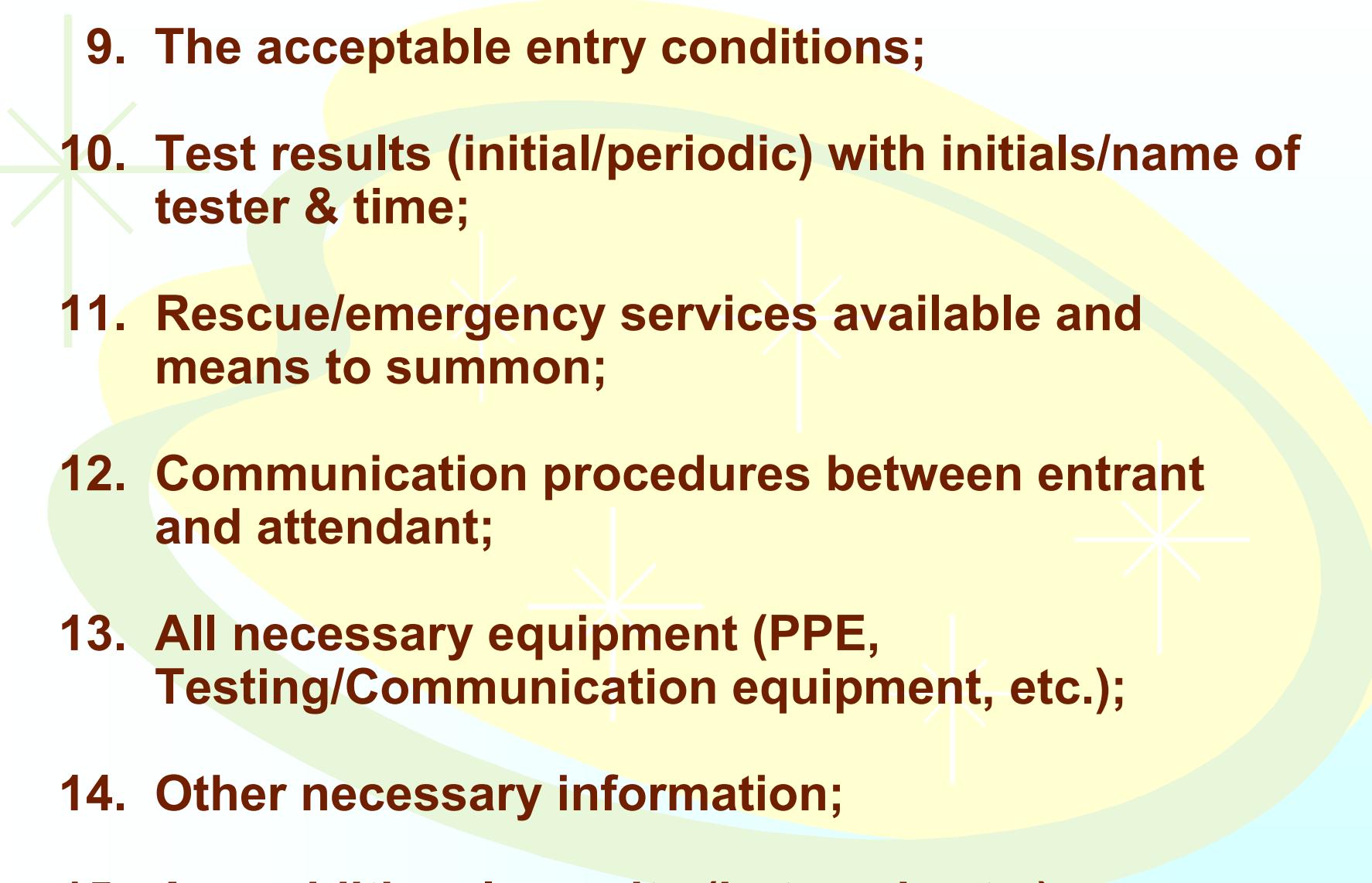
What is the written plan?

- ↗ **Developing and implementing rescue & emergency procedures**
- ↗ **Developing and implementing the entry permit procedures (issue, use, cancel)**
- ↗ **Coordinating multi-employer entry procedures**
- ↗ **Developing procedures for concluding the entry (closing off the space)**
- ↗ **The review & evaluation of entry operations during the year (as needed)**
- ↗ **The annual permit space program review using the historic permits**

The entry permit must document:

- 1. Permit space to be entered;**
- 2. Purpose of the entry;**
- 3. Date & duration of the entry permit;**
- 4. Authorized entrants;**
- 5. Attendants;**
- 6. Entry supervisor and place for signature;**
- 7. Hazards of the permit space;**
- 8. Isolation measures - hazard controls (purging, ventilating, etc.);**

The entry permit must document:

- 
- 9. The acceptable entry conditions;**
 - 10. Test results (initial/periodic) with initials/name of tester & time;**
 - 11. Rescue/emergency services available and means to summon;**
 - 12. Communication procedures between entrant and attendant;**
 - 13. All necessary equipment (PPE, Testing/Communication equipment, etc.);**
 - 14. Other necessary information;**
 - 15. Any additional permits (hot work, etc.).**

Duties to the Entry Team



The Entry Supervisor

The Attendant

The entrant

Identify Equipment For:



Testing and monitoring

Ventilating

Personal protection (PPE)

Communication

Lighting

Barriers and shields

Entry and exit

Rescue and emergency

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Rescue and Emergency procedures

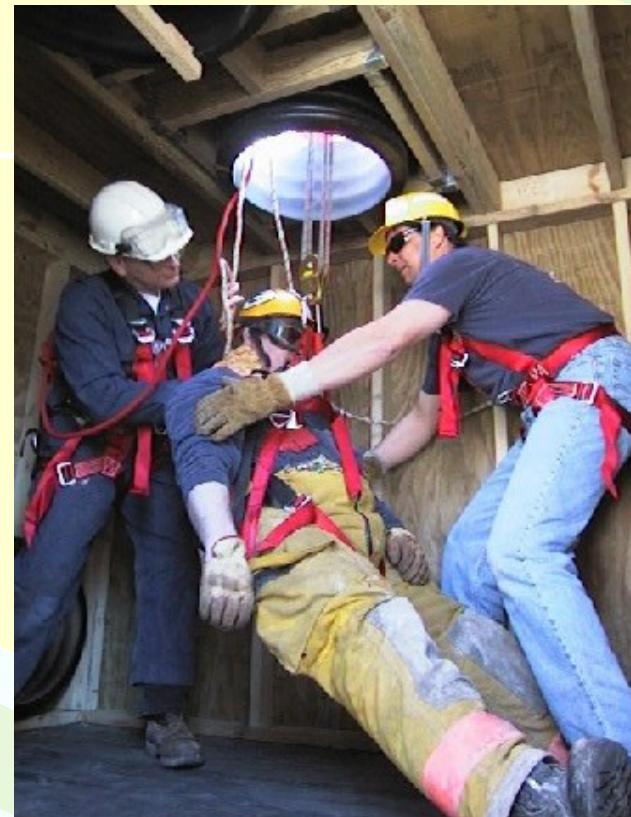


Three options to permit-required confined space rescue



1. Arrange for rescue service from an outside source.
2. Arrange for your own employees to provide rescue.
3. Provide for non-entry rescue.

Training



Who?

When?

- Initially
- When change in assigned duties
- When change in permit space operations
- Inadequacies in the employee's performance

Training must establish worker proficiency and include new or revised procedures to ensure compliance with permit space standards.

Be sure to include demonstration!



The content of the training must include:

Nature of hazards

Actions to take when exposed to hazards

Use of rescue and emergency equipment

Verify the appropriate training was completed through a written certification.

The certification must contain each employee's name, the signature(s) of the trainers, and the date(s) of the training.

Appendices





Before you run, time to review!